

MAR. 13. 2009 2:35PM

EAP&D 617 227 4420

MAR 13 2009

NO. 8786 P. 5

Application No. 10/804,328

2

Docket No.: 61032(70904)

AMENDMENTS TO THE CLAIMS

1. (Previously Presented) An optical information recording medium storing on a substrate information which can be reproduced by irradiation of a light beam, comprising:

a temperature responsive layer whose reflectance and/or transmittance changes with a change in temperature caused by the irradiation of a light beam; and

a light absorption layer which raises a temperature of the temperature responsive layer by absorbing the light beam to exchange the light beam into heat; and

a heat insulating layer which enables an efficient rise in temperature of the temperature responsive layer,

the temperature responsive layer, the light absorption layer, the heat insulating layer, and the substrate being provided in this order from a side from which the light beam enters.

2. (Original) The optical information recording medium as set forth in claim 1, wherein:

the reflectance and/or the transmittance of the temperature responsive layer with respect to the irradiation of the light beam changes by an interference effect between a reflection light of the light beam reflected on one face of the temperature responsive layer and a reflection light of the light beam reflected on the other face of the temperature responsive layer.

3. (Original) The optical information recording medium as set forth in claim 1, wherein:

the temperature responsive layer is arranged so that a low transmittance wavelength domain generated by absorption of a shorter wavelength side at an ordinary temperature is shifted toward a longer wavelength side or a shorter wavelength side by a certain degree of rise in temperature of the temperature responsive layer, so that a spectral transmittance and/or a spectral reflectance with respect to the wavelength of a readout light beam changes.

4. (Original) The optical information recording medium as set forth in claim 1, wherein:

the temperature responsive layer contains a metal oxide whose reflectance and/or transmittance changes with an increase in temperature.

BOS2 725834.1

Application No. 10/804,328

3

Docket No.: 81032(70904)

5. (Original) The optical information recording medium as set forth in claim 1,
wherein:

the temperature responsive layer contains a zinc oxide.

6. (Canceled)

7. (Original) The optical information recording medium as set forth in claim 1,
wherein:

the light absorption layer contains a phase change material, a magneto-optical material, or an alloy of the foregoing materials.

8. (Original) The optical information recording medium as set forth in claim 1,
wherein:

the light absorption layer contains Si, Ge, AgInSbTe, GeSbTe, TbFeCo, DyFeCo, GdFeCo, or an alloy of two or more types of the foregoing metals.

9. (Canceled)

10. (Original) The optical information recording medium as set forth in claim 1,
wherein:

the temperature responsive layer and the light absorption layer are adjacent to each other.

11. (Previously Presented) The optical information recording medium as set forth in claim 1, wherein:

a minute recording mark less than a diffraction limit of a readout light beam can be reproduced by a change in reflectance and/or transmittance with a change in temperature of the temperature responsive layer caused by the light beam, and the light absorption layer, and the heat insulating layer.

BOS2 725834.1

Application No. 10/804,328

4

Docket No.: 61032(70904)

12. (Previously Presented) An optical information recording medium for storing information by irradiation of a light beam and for allowing readout of the information by irradiation of a light beam, comprising:

- a recording layer for recording information;
 - a temperature responsive layer whose reflectance and/or transmittance changes with a change in temperature caused by the irradiation of a light beam; and
 - a light absorption layer which raises a temperature of the temperature responsive layer by absorbing the light beam to exchange the light beam into heat; and
 - a heat insulating layer which enables an efficient rise in temperature of the temperature responsive layer,
- the recording layer, the temperature responsive layer, the light absorption layer and the heat insulating layer, being provided in this order from a side from which the light beam is incident.

13. (Original) The optical information recording medium as set forth in claim 12, wherein:

the reflectance and/or the transmittance of the temperature responsive layer with respect to the irradiation of a light beam changes by an interference effect between a reflection light of the light beam reflected on one face of the temperature responsive layer and a reflection light of the light beam reflected on the other face of the temperature responsive layer.

14. (Original) The optical information recording medium as set forth in claim 12, wherein:

the temperature responsive layer is arranged so that a low transmittance wavelength domain generated by absorption of a shorter wavelength side at an ordinary temperature is shifted toward a longer wavelength side or a shorter wavelength side by a certain degree of rise in temperature of the temperature responsive layer, so that a spectral transmittance and/or a spectral reflectance with respect to the wavelength of a readout light beam changes.

15. (Original) The optical information recording medium as set forth in claim 12, wherein:

BOS2 725834.1

Application No. 10/804,328

5

Docket No.: 61032(70904)

the temperature responsive layer contains a metal oxide whose reflectance and/or transmittance changes with an increase in temperature.

16. (Original) The optical information recording medium as set forth in claim 12, wherein:

the temperature responsive layer contains a zinc oxide.

17. (Canceled)

18. (Original) The optical information recording medium as set forth in claim 12, wherein:

the light absorption layer contains a phase change material, a magneto-optical material, or an alloy of the foregoing materials.

19. (Original) The optical information recording medium as set forth in claim 18, wherein:

the light absorption layer contains Si, Ge, AgInSbTe, GeSbTe, TbFeCo, DyFeCo, GdFeCo, or an alloy of two or more types of the foregoing metals.

20. (Canceled)

21. (Original) The optical information recording medium as set forth in claim 12, wherein:

the temperature responsive layer and the light absorption layer are adjacent to each other.

22. (Previously Presented) The optical information recording medium as set forth in claim 12, wherein:

a minute recording mark less than a diffraction limit of a readout light beam can be reproduced by a change in reflectance and/or transmittance with a change in temperature of the temperature responsive layer caused by the light beam, and the light absorption layer, and the heat insulating layer.

BOS2 725834.1

Application No. 10/804,328

6

Docket No.: 61032(70904)

23. (Canceled)

24. (Previously Presented) A readout method for optical information recording medium storing, on a substrate, information which can be reproduced by irradiation of a light beam, the optical information recording medium comprising:

a temperature responsive layer whose reflectance and/or transmittance changes with a change in temperature caused by the irradiation of a light beam;

a light absorption layer which raises a temperature of the temperature responsive layer by absorbing the light beam to exchange the light beam into heat; and

a heat insulating layer which enables an efficient rise in temperature of the temperature responsive layer;

the temperature responsive layer, the light absorption layer, the heat insulating layer and the substrate being provided in this order from a side from which the light beam enters;

the method comprising the steps of:

irradiating the optical information recording medium with a light beam so as to generate a high temperature portion and a low temperature portion in a light beam spot of the temperature responsive layer, so that the transmittance of the temperature responsive layer decreases in the high temperature portion, and the high temperature portion is further heated by the light absorption layer and the heat insulating layer; and

reproducing the information with a light transmitted through the low temperature portion of the temperature responsive layer.

25. (Previously Presented) A readout method for an optical information recording medium storing, on a substrate, information which can be reproduced by irradiation of a light beam, the optical information recording medium comprising:

a temperature responsive layer whose reflectance and/or transmittance changes with a change in temperature caused by the irradiation of a light beam;

a light absorption layer which raises a temperature of the temperature responsive layer by absorbing the light beam to exchange the light beam into heat; and

a heat insulating layer which enables an efficient rise in temperature of the temperature responsive layer;

BOS2 725834.1

Application No. 10/804,328

7

Docket No.: 61032(70904)

the temperature responsive layer, the light absorption layer, the heat insulating layer and the substrate being provided in this order from a side from which the light beam enters,

the method comprising the steps of:

irradiating the optical information recording medium with a light beam so as to generate a high temperature portion and a low temperature portion in a light beam spot of the temperature responsive layer, so that the transmittance of the temperature responsive layer increases in the high temperature portion, and the high temperature portion is further heated by the light absorption layer and the heat insulating layer; and

reproducing the information with a light transmitted through the high temperature portion of the temperature responsive layer.

26. (Canceled)

27. (Canceled)

28. (Canceled)

29. (Previously Presented) An optical information readout device, comprising:

an optical information recording medium; and

an optical pickup for irradiating the optical information recording medium with a light beam,

wherein:

the optical information recording medium stores, on a substrate, information which can be reproduced by irradiation of a light beam, the optical information recording medium including:

a temperature responsive layer whose reflectance and/or transmittance changes with a change in temperature caused by the irradiation of a light beam; and

a light absorption layer which raises a temperature of the temperature responsive layer by absorbing the light beam to exchange the light beam into heat; and

a heat insulating layer which enables an efficient rise in temperature of the temperature responsive layer;

BOS2 725834.1

Application No. 10/804,328

8

Docket No.: 61032(70904)

the temperature responsive layer, the light absorption layer, the heat insulating layer and the substrate being provided in this order from a side from which the light beam enters; and

the optical pickup uses at least the temperature responsive layer, the light absorption layer and the heat insulating layer to reproduce information from a minute recording mark less than a diffraction limit of a readout light beam.

30. (Previously Presented) An optical information recording device, comprising:
an optical information recording medium; and
an optical pickup for irradiating the optical information recording medium with a light beam and for detecting a reflection light,

wherein:

the optical information recording medium is for storing information by irradiation of a light beam and for allowing readout of the information by irradiation of a light beam, the optical information recording medium including:

a recording layer for recording information;

a temperature responsive layer whose reflectance and/or transmittance changes with a change in temperature caused by the irradiation of a light beam; and

a light absorption layer which raises a temperature of the temperature responsive layer by absorbing the light beam to exchange the light beam into heat; and

a heat insulating layer which enables an efficient rise in temperature of the temperature responsive layer;

the recording layer, the temperature responsive layer, the light absorption layer, and the heat insulating layer being provided in this order from a side on which the light beam is incident; and

the optical pickup uses at least the temperature responsive layer, the light absorption layer, and the heat insulating layer, to record information from a minute recording mark less than a diffraction limit of a readout light beam.

31. (Canceled)

32. (Canceled)

BOS2 725834.1

Application No. 10/804,328

9

Docket No.: 61032(70904)

33. (Previously Presented) A readout method for an optical information recording medium storing, on a substrate, information which can be reproduced by irradiation of a light beam, the optical information recording medium comprising:

a temperature responsive layer whose reflectance and/or transmittance changes with a change in temperature caused by the irradiation of a light beam;

a light absorption layer which raises a temperature of the temperature responsive layer by absorbing the light beam to exchange the light beam into heat; and

a heat insulating layer which enables an efficient rise in temperature of the temperature responsive layer,

the temperature responsive layer, the light absorption layer, the tint insulation layer, and the substrate being provided in this order from a side from which the light beam enters;

the method comprising the step of:

using at least the temperature responsive layer, the light absorption layer, and the heat insulating layer, reproducing a minute recording mark less than a diffraction limit of a readout light beam.

34. (Currently Amended) A recording and/or readout method for an optical information recording medium for storing information by irradiation of a light beam and for allowing readout of the information by irradiation of a light beam, the optical information recording medium comprising:

a recording layer for recording information

a temperature responsive layer whose reflectance and/or transmittance changes with a change in temperature caused by the irradiation of a light beam;

a light absorption layer which raises a temperature of the temperature responsive layer by absorbing the light beam to exchange the light beam into heat; and

a heat insulating layer which enables an efficient rise in temperature of the temperature responsive layer,

the recording layer, the temperature responsive layer, the light absorption layer, and the heat insulating layer being provided in this order from a side on which the light beam is incident,

the method comprising the step of:

using at least the temperature responsive layer, the light absorption layer, and the heat insulating layer, reproducing a minute recording mark less than a diffraction limit of a readout light beam.

BOS2 725834.1

Application No. 10/804,328

10

Docket No.: 61032(70904)

35. (Currently Amended) A recording and/or readout method for an optical information recording medium for storing information by irradiation of a light beam and for allowing readout of the information by irradiation of a light beam, the optical information recording medium comprising:

- a recording layer or recording information
 - a temperature responsive layer whose reflectance and/or transmittance changes with a change in temperature caused by the irradiation of a light beam;
 - a light absorption layer which raises a temperature of the temperature responsive layer by absorbing the light beam to exchange the light beam into heat; and
 - a heat insulating layer which enables an efficient rise in temperature of the temperature responsive layer,
- the recording layer, the temperature responsive layer, the light absorption layer, and the heat insulating layer being provided in the order from a side on which the light beam is incident,
- the method comprising the steps of:
- irradiating the optical information recording medium with a light beam so as to generate a high temperature portion and a low temperature portion in a light beam spot of the temperature responsive layer, so that the transmittance of the temperature responsive layer decreases in the high temperature portion, and the high temperature portion is further heated by the light absorption layer and the heat insulating layer and
 - reproducing the information with a light transmitted through the low temperature portion of the temperature responsive layer.

36. (Currently Amended) A recording and/or readout method for an optical information recording medium for storing information by irradiation of a light beam and for allowing readout of the information by irradiation of a light beam, the optical information recording medium comprising:

- a recording layer for recording information:
- a temperature responsive layer whose reflectance and/or transmittance changes with a change in temperature caused by the irradiation of a light beam;
- a light absorption layer which raises a temperature of the temperature responsive layer by absorbing the light beam to exchange the light beam into heat; and

BOS2 725834.1

Application No. 10/804,328

11

Docket No.: 61032(70904)

a heat insulating layer which enables an efficient rise in temperature of the temperature responsive layer,

the recording layer, the temperature responsive layer, the light absorption layer, and the heat insulating layer being provided in this order from a side on which the light beam is incident, the method comprising the steps of:

irradiating the optical information recording medium with a light beam so as to generate a high temperature portion and a low temperature portion in a light beam spot of the temperature responsive layer, so that the transmittance of the temperature responsive layer increases in the high temperature portion, and the high temperature portion is further heated by the light absorption layer and the heat insulating layer; and

reproducing the information with a light transmitted through the high temperature portion of the temperature responsive layer.

37. (Previously Presented; Allowable) An optical information recording medium storing, on a substrate, information which can be reproduced by irradiation of a light beam, comprising:

in this order from a side on which the light beam is incident;

a film formed from one selected from the group consisting of ZnO, ZnS, SnO₂, CeO₂, NiO₂, In₂O₃, TiO₂, Ta₂O₅, VO₂, and SrTiO₃;

a film formed from Si, Ge, AgInSbTe, GeSbTe, TbFeCo, DyFeCo, and GdFeCo;

a film formed from one of SiN and AlN; and

a substrate.

38. (Previously Presented) An optical information readout device, comprising:

an optical information recording medium; and

an optical pickup for irradiating the optical information recording medium with a light beam,

wherein:

the optical information recording medium stores, on a substrate, information which can be reproduced by irradiation of a light beam, the optical information recording medium including:

a temperature responsive layer whose reflectance and/or transmittance changes with a change in temperature caused by the irradiation of a light beam;

BOS2 725834.1

Application No. 10/804,328

12

Docket No.: 61032(70904)

a light absorption layer which raises a temperature of the temperature responsive layer by absorbing the light beam to exchange the light beam into heat; and

a heat insulating layer which enables an efficient rise in temperature of the temperature responsive layer,

the temperature responsive layer, the light absorption layer, the heat insulating layer, and the substrate being provided in this order from a side from which the light beam enters; and

the optical pickup:

irradiates the optical information recording medium with a light beam so as to generate a high temperature portion and a low temperature portion in a light beam spot of the temperature responsive layer, so that the transmittance of the temperature responsive layer decreases in the high temperature portion, and the high temperature portion is further heated by the light absorption layer and the heat insulating layer; and

reproduces the information with a light transmitted through the low temperature portion of the temperature responsive layer.

39. (Previously Presented) An optical information readout device, comprising:

an optical information recording medium; and

an optical pickup for irradiating the optical information recording medium with a light beam,

wherein:

the optical information recording medium stores on a substrate, information which can be reproduced by irradiation of a light beam, the optical information recording medium including:

a temperature responsive layer whose reflectance and/or transmittance changes with a change in temperature caused by the irradiation of a light beam; and

a light absorption layer which raises a temperature of the temperature responsive layer by absorbing the light beam to exchange the light beam into heat; and

a heat insulating layer which enables an efficient rise in temperature of the temperature responsive layer, the temperature responsive layer, the light absorption layer, the heat insulating layer, and the substrate being provided in this order from a side from which the light beam enters; and

the optical pickup:

BOS2 725834.1

Application No. 10/804,328

13

Docket No.: 61032(70904)

irradiates the optical information recording medium with a light beam so as to generate a high temperature portion and a low temperature portion in a light beam spot of the temperature responsive layer, so that the transmittance of the temperature responsive layer increases in the high temperature portion, and the high temperature portion is further heated by the light absorption layer and the heat insulating layer and,

reproduces the information with a light transmitted through the high temperature portion of the temperature responsive layer.

40. (Currently Amended) An optical information recording/readout device, comprising: an optical information recording medium; and

an optical pickup for irradiating the optical information recording medium with a light beam,

wherein:

the optical information recording medium is for storing information by irradiation of a light beam and for allowing recording and/or readout of the information by irradiation of a light beam, the optical information recording medium including:

a recording layer for recording information

a temperature responsive layer whose reflectance and/or transmittance changes with a change in temperature caused by the irradiation of a light beam; and a light absorption layer which raises a temperature of the temperature responsive layer by absorbing the light beam to exchange the light beam into heat; and a heat insulating layer which enables an efficient rise in temperature of the temperature responsive layer, the recording layer, the temperature responsive layer, the light absorption layer, and the heat insulating layer being provided in this order from a side on which the light beam is incident: and

the optical pickup uses at least the temperature responsive layer, the light absorption layer and the heat insulating layer, to reproduce a minute recording mark less than a diffraction limit of a readout light beam.

41. (Currently Amended) An optical information recording/readout device, comprising: an optical information recording medium; and an optical pickup for irradiating the optical information recording medium with a light beam,

wherein:

BOS2 725834.1

Application No. 10/804,328

14

Docket No.: 61032(70904)

the optical information recording medium is for storing information by irradiation of a light beam and for allowing recording and/or readout of the information by irradiation of a light beam, the optical information recording medium including:

a recording layer for recording information;

a temperature responsive layer whose reflectance and/or transmittance changes with a change in temperature caused by the irradiation of a light beam;

a light absorption layer which raises a temperature of the temperature responsive layer by absorbing the light beam to exchange the light beam into heat; and

a heat insulating layer which enables an efficient rise in temperature of the temperature responsive layer,

the recording layer, the temperature responsive layer the light absorption layer, and the heat insulating layer being provided in this order from a side on which the light beam is incident; and

the optical pickup:

irradiates the optical information recording medium with a light beam so as to generate a high temperature portion and a low temperature portion in a light beam spot of the temperature responsive layer, so that the transmittance of the temperature responsive layer decreases in the high temperature portion, and the high temperature portion is further heated by the light absorption layer and the heat insulating layer and reproduces the information with a light transmitted through the low temperature portion of the temperature responsive layer.

42. (Currently Amended) An optical information recording/readout device, comprising:

an optical information recording medium; and

an optical pickup for irradiating the optical information recording medium with a light beam,

wherein;

the optical information recording medium is for storing information by irradiation of a light beam and for allowing recording and/or readout of the information by irradiation of a light beam., the optical information recording medium including:

a recording layer for recording information;

a temperature responsive layer whose reflectance and/or transmittance changes with a change in temperature caused by the irradiation of a light beam;

EQS2 725834.1

Application No. 10/804,328

15

Docket No.: 61032(70904)

a light absorption layer which raises a temperature of the temperature responsive layer by absorbing the light beam to exchange the light beam into heat: and

a heat insulating layer which enables an efficient rise in temperature of the temperature responsive layer, the recording layer, the temperature responsive layer, the light absorption layer, and the heat insulating layer being provided in this order from a side on which the light beam is incident: and

the optical pickup:

irradiates the optical information recording medium with a light beam so as to generate a high temperature portion and a low temperature portion in a light beam spot of the temperature responsive layer, so that the transmittance of the temperature responsive layer increases in the high temperature portion, and the high temperature portion is further heated by the light absorption layer and the heat insulating layer and

reproduces the information with a light transmitted through the high temperature portion of the temperature responsive layer.

43. (Canceled)

44. (Canceled)

45. (Canceled)

46. (Canceled)

47. (Canceled)

48. (Canceled)

49. (Previously Presented) An optical information recording medium storing information which is reproduced by irradiation of a light beam, comprising:

a temperature responsive layer whose reflectance and/or transmittance changes according to a change in temperature caused by the irradiation of a light beam;

BOS2 725834.1

Application No. 10/804,328

16

Docket No.: 61032(70904)

a light absorption layer which changes the temperature of the temperature responsive layer; and

a heat insulating layer which enables an efficient rise in temperature of the temperature responsive layer,

wherein the light absorption layer contains a phase change material, a magneto-optical material, or an alloy of the foregoing materials.

50. (Previously Presented) The optical information recording medium

as set forth in claim 49, wherein:

the light absorption layer contains Si, Ge, AgInSbTe, GeSbTe, TbFeCo, DyFeCo, GdFeCo, or an alloy of two or more of the foregoing metals.

51. (Currently Amended) An optical information recording medium for storing information by irradiation of a light beam and for reading out the information by irradiation of a light beam, comprising a temperature responsive layer whose reflectance and/or transmittance changes with a change in temperature caused by the irradiation of a light beam;

a light absorption layer which changes a temperature of the temperature responsive layer; and

a heat responsive insulating layer which enables an efficient rise in temperature of the temperature responsive layer,

wherein the light absorption layer contains a phase change material, a magneto-optical material, or an alloy of the foregoing materials.

52. (Previously Presented) The optical information recording medium as set forth in claim 51, wherein:

the light absorption layer contains Si, Ge, AgInSbTe, GeSbTe, TbFeCo, DyFeCo, GdFeCo, or an alloy of two or more of the foregoing metals.

53. (New) An optical information readout device as set forth in claim 29, wherein:

The temperature responsive layer is a film formed from one of ZnO, ZnS, SnO₂, CeO₂, NiO₂, In₂O₃, TiO₂, Ta₂O₅, VO₂, and SrTiO₃;

BOS2 725834.1

Application No. 10/804,328

17

Docket No.: 61032(70904)

the light absorption layer is a film formed from one of Si, Ge, AgInSbTe, GeSbTe, TbFeCo, DyFeCo, and GdFeCo; and

the heat insulating layer is a film formed from one of SiN and AlN.

53. (New) A readout method for an optical information recording medium as set forth in claim 33, wherein:

the temperature responsive layer is a film formed from one of ZnO, ZnS, SnO₂, CeO₂, NiO₂, In₂O₃, TiO₂, Ta₂O₅, VO₂, and SrTiO₃;

the light absorption layer is a film formed from one of Si, Ge, AgInSbTe, GeSbTe, TbFeCo, DyFeCo, and GdFeCo; and

the heat insulating layer is a film formed from one of SiN and AlN.

BOS2 725834.1